



Tanta University
Faculty of Engineering

Decision Support Systems

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Textbook

- The following texts are recommended:
- *Decision Support Systems and Intelligent Systems*, Ephraim Turban and Jay Aronson, Prentice-Hall, 2005.
- *Hand Book On Decision Support Systems*, F. Burstein, Springer, 2008
- *Making Hard Decisions Second Edition*, Robert Clemen, Duxbury, 1996



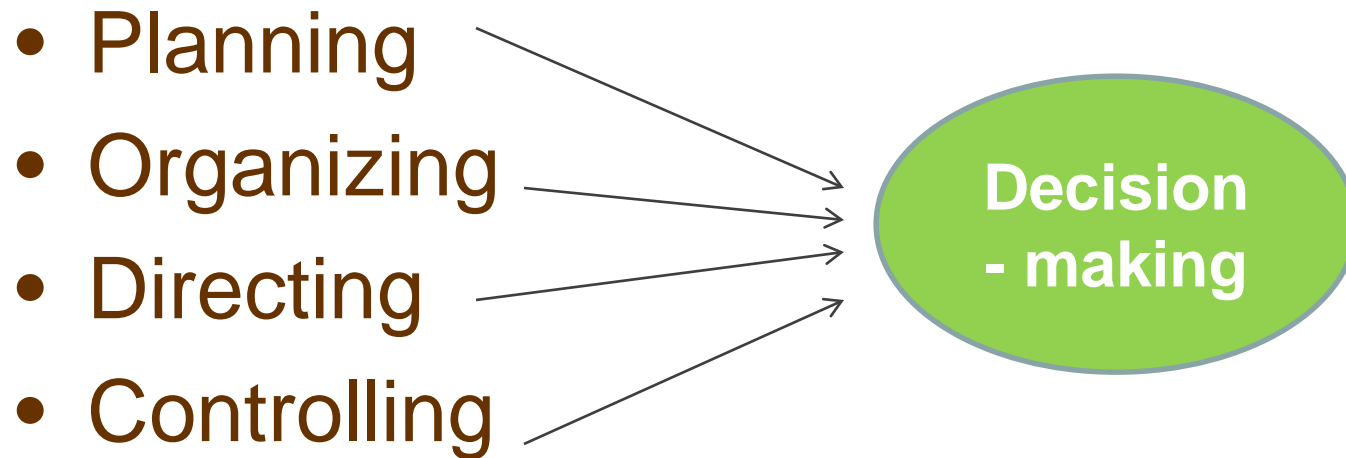
Decision Making & Management



Decision-Making

- Decision-making is a process of choosing among alternative courses of action for the purpose of attaining a goal or goals.
- According to Simon (1977), managerial decision-making is synonymous with the whole process of management.
- Consider the important managerial function of planning. Planning involves a series of decisions: What should be done? When? Where? Why? How? By whom?
- **What are the main managerial functions?**
- Managers set goals, or plan; hence, planning implies decision-making. Other managerial functions, such as organizing and controlling, also involve decision-making.

Managerial functions





A Hypothetical Decision Making Example

- A third world country is going to **build a railway** system to connect a potential inland industrial area and a good agricultural area with a port.
- An international development agency recommended that the iron in the area should be mined and refined locally and melt using industries which has to be established.
- The refined iron is possibly exported to Germany and Japan for car industry.
- For success of project it requires supply of skilled labor. To overcome this problem a training center has to be established to train workers by the time plant gets ready.
- The development agency also recommends the fertile land in the area should be prepared for intensive farming to provide food for the consumption of the people working in the industry.
- The railway should link the industrial area, farm and port.
- **What are the issues dealt with for this project establishment?**



Issues dealt with

- **Is the route optimum?** Are all likely users connected? What are the possible routes?
- **Growth of traffic:** To what extent does development of railway depends on development of port, new town, airport, industrial area and agricultural area?
- **Competition:** To what extent would development of an improved road would eliminate the need for railway?
- **Engineering problems:** How much electricity is needed for electrical train?
- **Supply problem:** Where will supply of equipment and constructors sought from?
- **Operational problem:** With inadequate supply of local skilled workers where will operating team be obtained from? Will foreign operating contactors be used?
- **Time Scale:** When to start the project and when it will be finished?
- **Cost:** What will the total cost of project be?
- **Infrastructure:** Will services available include: telephone, water, radio communication, hospitals, hotels and housing?

Essential steps in the process of making a decision for a project establishment

Step 1

Concept of Project is Identified

Decision To Proceed

Decision To Abandon

Step 2

Project assessment. Taking account of all issues involved

Decision To Proceed

Decision To Abandon

Step 3

Project Goes to Detail Specification For Tender

Decision To Proceed

Decision To Abandon

Step 4

Tender Accepted. Construction Starts

Decision To Proceed

Decision To Abandon

Step 5

Operation Starts

Decision To Proceed

Decision To Abandon



Step 1

- The **conceptual need** for a project arise mainly as a result of future requirements.
- It may be made by a **team of experts**.
- Typically a conceptual study will identify the technical solution required, the economic merits, and **acceptability of project** in socio political terms.
- It may require discussion with financial institutions whether or not they will provide **necessary funds**.



Step 2

- Assuming the decision has been made to develop the project further then a **detailed assessment** will have to be made of all technical, economic and socio-political factors.
- A major decision making is about **novelty of project**.
 - A project may **technically** be novel (making a new airplane).
 - The project may employ an established technology in **novel environment** (using electrical train in third world country).
- In this step the **degree of uncertainty** associated with each factor will begin to emerge.
- An **understanding of uncertainty** associated with any proposal is essential for a feasible decision making.
- If you want to go to Iran to build a plant for short skirts? Is this project acceptable, why?



Step 3

- If the outcome of step 2 is to proceed the project, then a **tender specification** has to be prepared.
- It should define, exactly what work the tender is required to do. Ideally it has to **define every thing** that has to be done.
- The magnitude of uncertainty associated with this stage is a reason for possible variations in cost and duration of projects.
- Before a tender specification is issued it is prudent to confirm that the project is acceptable to regulatory authorities and that the adequate finance is available.
- The financier need to be convinced that the project is viable, that the proposer is sound and has the experience and capability to derive the project to a successful conclusion.



Step 4 ,5

- Step 4
 - The first action is to **decide** if one of the tender should be accepted.
 - The tenderer should have the appropriate experience, capability and adequate financial resources.
- Step 5
 - Assuming all steps completed satisfactorily, a decision has to be taken to start the project.
 - Even if the project starts, it might have to be stopped if the environment it operates is changed.



Decision making characteristics

- Decision is made based on the **information** available.
- At each part of the assessment, there may have to be **iterative development** to take account improvement in data that take place as the project proceeds.
- A project will not go ahead unless there is adequate **funding**.



Decision making characteristics

- There are many uncertainties:
 - Currency exchange
 - How do you attract customers ?
 - Will the competitors reduce their fees?
 - What new services will the competitor offer and what should you do in response?
 - Governmental Regulations and legislations increase and change.



Management

- *Management is decision making*
- The *manager* is a decision maker
- Organizations are filled with decision makers at different level.
- Management is considered as art: a talent acquired over years by trial-and-error.
- However decision making today is becoming more complicated.



Factors Affecting Decision-Making

- New technologies and better information distribution have resulted in more alternatives for management.
- Complex operations and organizations structures have increased the costs of errors, causing a chain reaction throughout the organization.
- Rapidly changing global economies and markets are producing greater uncertainty and requiring faster response in order to maintain competitive advantages.
- Increasing governmental regulation coupled with political destabilization have caused great uncertainty.



Management Levels

- In organizations, there are typically three levels of management: [top-level](#), [middle-level](#), and [first-level](#).
- These three main levels of managers form a [hierarchy](#), in which they are ranked in order of importance.
- In most organizations, the number of managers at each level is such that the hierarchy resembles a pyramid, with many more first-level managers, fewer middle managers, and the fewest managers at the top level.



TOP-LEVEL MANAGERS

- Top-level managers, or top managers, are also called senior management or executives. These individuals are at the top one or two levels in an organization, and hold titles such as:
 - Chairperson of the Board or President.
 - Vice president.
 - Chief Executive Officer (CEO),
 - Chief Financial Officer (CFO),
 - Chief Operational Officer (COO),
 - Chief Information Officer (CIO).
- Top managers do not direct the day-to-day activities of the firm; rather, they set goals for the organization and direct the company to achieve them.



Mid-Level Managers

- Those in the levels below top managers. Middle managers' job titles include: General manager, Plant manager, Regional manager, and Divisional manager.
- Middle-level managers are responsible for carrying out the goals set by top management. They do so by setting goals for their departments and other business units.
- Middle managers can motivate and assist first-line managers to achieve business objectives. Middle managers may also communicate upward, by offering suggestions and feedback to top managers.



FIRST-LEVEL MANAGERS

- First-level managers are also called first-line managers or supervisors. These managers have job titles such as: Office manager, Shift supervisor, Department manager, Foreperson, Crew leader, Store manager.
- First-line managers are responsible for the daily management of line workers—the employees who actually produce the product or offer the service.



Question?

- Apply these levels to your university
 - University President /Council Chair
 - University Vice President
 - Faculty Dean
 - Faculty Vice Dean
 - Heads of departments



Elements of Management Problems

- Most management problems for which decisions are sought can be represented by three standard elements – objectives, decision variables, and constraints.
- **Objectives**
 - Maximize profit / Minimize cost
 - Provide earliest entry into market
 - Minimize employee/customer discomfort
- **Decision variables**
 - Determine what price to use
 - Determine length of time tests should be run on a new product/service
 - Determine the responsibilities to assign to each worker
- **Constraints**
 - Can't charge below cost
 - Test enough to meet minimum safety regulations
 - Ensure responsibilities are at most shared by two workers



Mintzberg's 10 Management Roles

- Interpersonal
 - Figurehead
 - Leader
 - Liaison
- Informational
 - Monitor(nerve center of the organization)
 - Disseminator
 - Spokesperson
- Decisional
 - Entrepreneur
 - Disturbance Handler
 - Resource Allocation
 - Negotiator



Degree of success?

- Management is a process by which organizational goals are achieved through the use of resources.
- These resources are considered to be inputs
- Attainment of the goals is viewed as the output of the process.
- How to measure the degree of success of an organization?




Productivity

- The ratio of outputs to inputs that measures the degree of success of an organization and its individual parts

$$\text{Productivity} = \frac{\text{Outputs (products, services)}}{\text{Inputs (resources)}}$$

- This measure of productivity can be used to measure the productivity of one worker or many, as well as the productivity of a machine, a department, the whole firm, or even a nation.
- **Total productivity** is used when measuring productivity for all inputs combined.

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- For example, let's say a company produces weekly the equivalent of \$10,000 in output in the form of finished goods. Let's also say that the weekly value of all the inputs combined—including labor, materials, and other costs—is \$5,000. Total productivity for the week for the company is

Total Productivity = output/input = \$10,000/\$5,000 = 2.0

- ***Partial productivity*** or *single-factor productivity* is when we compute productivity as the ratio of output relative to a single input.

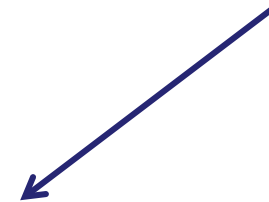
Example

Notation

We will call respectively:

- **Y** :the value of obtained production(output)
- **L** :the value or quantity of labour employed in production (input)
- **K** :the value or quantity of capital employed in production(input)

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- Labour partial productivity index
 - The labour partial productivity index (LPI) is given by:

$$P_L = \frac{Y}{L}$$

- The time comparison between the present year t and a base year s (generally the previous year) can be obtained by calculating the variation of the partial productivity labour index


$$\frac{Y_t}{L_t} / \frac{Y_s}{L_s} = \frac{Y_t}{Y_s} / \frac{L_t}{L_s} = \frac{IY_{(s,t)}}{IL_{(s,t)}}$$

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- Capital partial productivity index
 - The partial capital productivity index (CPI) is given by:


$$P_K = \frac{Y}{K}$$

- The time comparison between the present year t and a base year s (generally the previous year) can be obtained by calculating the variation index of capital partial productivity

$$\frac{Y_t}{K_t} / \frac{Y_s}{K_s} = \frac{Y_t}{Y_s} / \frac{K_t}{K_s} = \frac{IY_{(s,t)}}{IK_{(s,t)}}$$

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- Suppose that a business process X produces a given product and that the distance between s and t is of 2 years. We proceed to calculating the change in labor and capital productivity in the 2 years.

Data	s	t
quantity produced (thousands)	21.5	24.6
number of employees (1)	75	80
yearly hours per employee (2)	1772	1760
employee yearly hours=(1)*(2)	132900	140800
machine hours	8500	9100




$$IY(s, t) = \frac{Y_t}{Y_s} = \frac{24.6}{21.5} = 1.442$$

- So between the year s and t production increased of 44.2%.
- Then proceed to the calculation of the variation in productivity work from s to t.

$$IL(s, t) = \frac{L_t}{L_s} = \frac{140800}{132900} = 1.0594$$

- The variation of labour productivity from s to t is given by:

$$\frac{IY_{(s,t)}}{IL_{(s,t)}} = \frac{1.442}{1.0594} = 1.36$$

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- It has therefore been, within the two years, an increase in the labor productivity by 36%.
 - In a similar way it can be calculated the change in the capital productivity (+ 34.7%).



Data? Information ?

- Management and decision making depend in a great way on data collection and information.
- So, what is:
 - » Data ?
 - » Information ?

Data? Information ?



- **Data** is raw. Items about things, events, activities, and transactions are recorded, classified, and stored but are not organized to convey any specific meaning. Data items can be numeric, alphanumeric, figures, sounds, or images.
- **Information** is data that have been organized in a manner that gives them meaning and to become understandable.
- **Knowledge:** refer to information having been processed, organized or structured in some way.
- **Wisdom:** involves using knowledge for the greater good. The seeking of knowledge to apply to the given circumstance.
- *What do you know about DIKW pyramid?*



Example:

- **Data:** I have one item.
- **Information:** It's a tomato. *Now, we understand the item and its characteristics.*
- **Knowledge:** A tomato is a fruit.
- **Wisdom:** Tomato is never added to a fruit salad.



Data? Information?

- **Meta-data** is "data" about data such as:
 - Means of creation of the data
 - Purpose of the data
 - Time and date of creation
 - Creator or author of the data
 - Location on a computer network where the data was created
- For example, a digital image may include metadata that describe how large the picture is, the color depth, the image resolution, when the image was created, and other data.
- (meta means "after", or "beyond")